CARDIOLOGIE TUNISIENNE

CASE REPORT

Dual Aortic Pseudoaneurysm Complicating Infective Endocarditis in a Child with Prior Subvalvular Aortic Stenosis Repair: A Case Report and Literature Review

Pseudoanévrysmes Aortiques Compliquant une Endocardite Infectieuse chez un enfant avec Antécédent de Correction Chirurgicale de Sténose Sous-Valvulaire Aortique : À Propos d'un Cas et Revue de la Littérature

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Summary

Introduction: Aortic pseudoaneurysm is a rare and life-threatening complication of infective endocarditis (IE), resulting from progressive destruction of the aortic wall by the infectious process. Its occurrence in children with prior surgical correction of congenital heart disease is exceptional and carries a particularly poor prognosis.

Case Summary.: We report the case of a 10-year-old male with a history of surgical resection of a subaortic diaphragmatic membrane (2024) who was admitted in March 2026 for definite aortic IE classified according to the modified Duke criteria (one major criterion: two mobile supravalvular vegetations; three minor criteria: fever, Janeway lesions, and predisposing cardiac condition). Multimodality imaging revealed two pseudoaneurysms of the ascending aorta at the sino-tubular junction -the larger measuring 63 × 51 mm- and moderate hemopericardium on cardiac CT. Emergent surgery included pseudoaneurysm exclusion, bioprosthetic aortic valve replacement (size 19), annular enlargement using Manouguian and Konno techniques, and aortic wall reconstruction. Despite technical success, the patient developed multiorgan failure and died postoperatively.

Conclusion: This case highlights the diagnostic challenge and poor prognosis of dual aortic pseudoaneurysm complicating IE in a child with complex LVOT anatomy, underscoring the critical role of multimodality imaging and early multidisciplinary surgical management.

Keywords

Infective endocarditis · Aortic pseudoaneurysm · Subvalvular aortic stenosis · Pediatric cardiology · Cardiac CT · Multimodality imaging

Résumé

Introduction: Le pseudoanévrysme aortique est une complication rare et potentiellement fatale de l'endocardite infectieuse (EI), résultant de la destruction progressive des couches aortiques par le processus infectieux. Sa survenue chez l'enfant avec antécédent de chirurgie cardiaque congénitale est exceptionnelle et associée à un pronostic particulièrement sombre.

Présentation du cas: Nous rapportons le cas d'un enfant de 10 ans, opéré en 2024 pour sténose sous-valvulaire aortique congénitale sévère par résection d'une membrane sous-aortique, admis en mars 2026 pour EI aortique définie selon les critères de Duke modifiés (un critère majeur : deux végétations supravalvulaires mobiles ; trois critères mineurs : fièvre, lésions de Janeway, cardiopathie prédisposante). L'imagerie multimodale a objectivé deux pseudoanévrysmes de l'aorte ascendante à la jonction sino-tubulaire -le plus grand mesurant 63 × 51 mm- et un hémopéricarde modéré au scanner cardiaque. La prise en charge chirurgicale urgente a consisté en l'exclusion des pseudoanévrysmes, un remplacement valvulaire aortique par bioprothèse (taille 19), un élargissement annulaire selon les techniques de Manouguian et Konno, et une reconstruction de la paroi aortique antérieure. Malgré le succès technique, le patient a développé une défaillance multiviscérale et est décédé en postopératoire.

Conclusion: Ce cas illustre les défis diagnostiques et le pronostic sévère des pseudoanévrysmes aortiques compliquant une EI chez l'enfant porteur d'une anatomie complexe de la chambre de chasse du ventricule gauche, soulignant le rôle critique de l'imagerie multimodale et la nécessité d'une prise en charge chirurgicale précoce et multidisciplinaire.

Mots-clés

Endocardite infectieuse · Pseudoanévrysme aortique · Sténose sous-valvulaire aortique · Cardiologie pédiatrique · Scanner cardiaque · Imagerie multimodale

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INTRODUCTION

Infective endocarditis (IE) remains a serious condition associated with high morbidity and mortality, particularly when complicated by periannular extension such as abscess or pseudoaneurysm formation. A pseudoaneurysm results from contained rupture of infected peri-valvular tissue driven by progressive destruction of the aortic wall layers. This complication carries a poor prognosis due to the risk of rupture, fistulization into adjacent cardiac structures, hemodynamic deterioration, and systemic embolization [1,2].

IE in children is a distinct clinical entity occurring predominantly in patients with underlying congenital heart disease (CHD), which accounts for 77–87% of pediatric IE cases [3,4]. Prior cardiac surgery significantly amplifies this risk, with post-surgical IE rates of 46–51% in dedicated pediatric series [5,6]. The association of prior surgical correction for subvalvular aortic stenosis and subsequent IE complicated by dual aortic pseudoaneurysm formation is to our knowledge exceptional, with very few analogous cases reported in the literature. We present this case to highlight the diagnostic challenge, the pivotal role of multimodality imaging, and the poor prognosis of this complication in the pediatric population, accompanied by a focused review of the relevant literature.

CASE PRESENTATION

Clinical assessment

A 10-year-old male patient, with a history of surgical correction of severe congenital subvalvular aortic stenosis in 2024 -consisting of resection of a subaortic diaphragmatic membrane -was admitted in March 2026 to the Cardiology Department for a 2-week history of fever and progressive general deterioration. On admission, the patient was hemodynamically stable with a blood pressure of 120/70 mmHg and a heart rate of 140 beats per minute. Body temperature was 39°C with an oxygen saturation of 96% on room air and clear lung fields on auscultation. Peripheral examination revealed Janeway lesions on the palms, without Osler nodes or Roth spots.

Electrocardiography

The 12-lead ECG demonstrated sinus tachycardia at 140 bpm with electrical criteria for left ventricular hypertrophy, without conduction abnormalities or PR prolongation.

Laboratory investigations

Complete blood count revealed hypochromic microcytic anemia (hemoglobin 7.6 g/dL) and leukocytosis (10,400/mm^3). C-reactive protein was markedly elevated at 200 mg/L. Renal function and liver enzymes were within normal limits. Six sets of blood cultures drawn prior to antibiotic initiation returned negative at 5 days of incubation. This pattern of culture-negative IE may reflect prior antibiotic exposure in the community setting, or less commonly infection by fastidious organisms such as Coxiella burnetii, Bartonella spp., or HACEK-group bacteria. Specific serologies for Coxiella burnetii and Bartonella spp. were requested as part of extended etiological workup.

Echocardiographic findings

Transthoracic echocardiography (TTE) was performed on admission under conditions of tachycardia and severe anemia (hemoglobin 7 g/dL; BSA = 0.97 m^2) and revealed: a non-dilated hypertrophied left ventricle with moderately impaired systolic function (LVEF 45%); grade III aortic regurgitation; grade II mitral regurgitation; severe tunnel-type and diaphragmatic subvalvular aortic stenosis (Vmax 4.56 m/s; mean gradient 50.34 mmHg); two mobile supravalvular echogenic images consistent with aortic vegetations; markedly apparent enlargement o f the aortic root with sinus of Valsalva measuring 53 mm (indexed 54.6 mm/m^2); moderate pulmonary hypertension (estimated PASP 45 mmHg); and a small circumferential pericardial effusion (Figure 1).

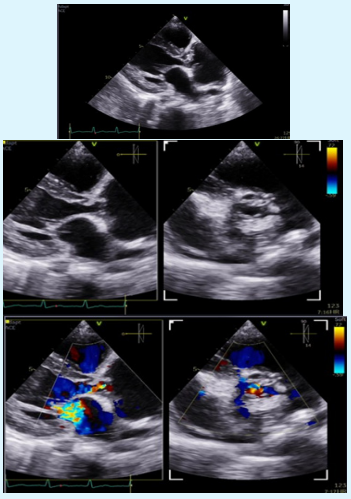

Figure 1. Transthoracic echocardiography -parasternal views.

(A) Parasternal long-axis view in end-diastole: markedly dilated aortic root (sinus of Valsalva 53 mm; indexed 54.6 mm/m^2) with a dense heterogeneous supravalvular mass consistent with large vegetations. Concentric left ventricular hypertrophy reflects chronic subvalvular pressure overload. (B–C) Parasternal long-axis and short-axis 2D views: intraluminal vegetation burden confirmed in both planes. (D–E) Corresponding colour Doppler views: turbulent mosaic flow across the LVOT (mean gradient 50 mmHg) and grade III aortic regurgitation jet reflecting the combined obstructive-regurgitant haemodynamic lesion.

Diagnostic classification

According to the modified Duke criteria, the diagnosis of definite infective endocarditis was established on the basis of one major criterion -echocardiographic evidence of two mobile supravalvular aortic vegetations -and three minor criteria: fever ≥38°C, Janeway lesions, and a predisposing cardiac condition consisting of prior surgical correction of subvalvular aortic stenosis with residual moderate aortic regurgitation. The combination of one major and three minor criteria fulfils the modified Duke classification for definite IE [2].

Cardiac CT findings

Contrast-enhanced cardiac CT further characterized the extent of structural involvement (Figure 2). Aortic annulus measured 14 × 12 mm, sinus of Valsalva 21 × 23 × 23 mm, and sino-tubular junction 18 × 12 mm. A large sacciform pseudoaneurysm arose from the anterolateral aspect of the sino-tubular junction, displacing the right coronary artery anteriorly, measuring 63 × 51 mm. A second adjacent pseudoaneurysm measured 11 × 5 mm with a neck of 4 mm. Moderate hemopericardium and lower lingular pulmonary atelectasis were also documented, confirming the diagnosis of aortic IE complicated by dual ascending aortic pseudoaneurysms.

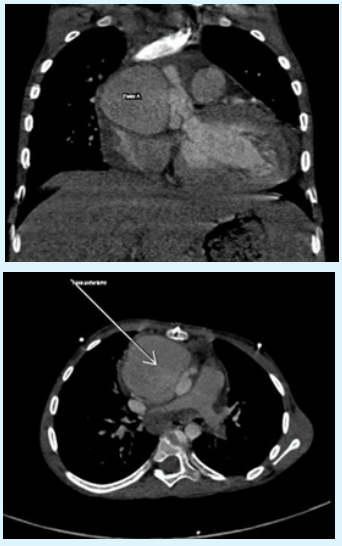

Figure 2. Contrast-enhanced cardiac CT -coronal and axial reconstructions.

(A) Coronal reconstruction: a large contrast-filled sacciform pseudoaneurysm («Faux A») arising from the sino-tubular junction of the ascending aorta, measuring 63 × 51 mm, displacing mediastinal structures with associated dense haemopericardium. (B) Axial reconstruction at the sino-tubular junction level: the anterolateral pseudoaneurysm (long arrow) communicates with the aortic lumen via a visible neck, with a contiguous second pseudoaneurysm (11 × 5 mm) (short arrow). Anterior displacement of the right coronary artery and circumferential pericardial effusion are identified.

Therapeutic management

Empirical intravenous antibiotic therapy was initiated immediately following blood culture collection, combining Ceftriaxone 2.6 g/24h, Ampicillin 1.3 g × 4/24h, and Gentamicin 78 mg/24h, in accordance with ESC 2015 guidelines for culture-negative endocarditis [2]. Two units of packed red blood cells were transfused targeting hemoglobin ≥10 g/dL. Given the presence of a large aortic pseudoaneurysm measuring 63 mm, active hemopericardium, and critically compromised LVOT anatomy in the context of definite infective endocarditis, an urgent multidisciplinary decision was made for surgical intervention within 24 hours of admission.

Surgical intervention

Surgery consisted of exclusion of both pseudoaneurysms, replacement of the aortic valve with a size-19 bioprosthetic valve, combined annular enlargement using the Manouguian and Konno techniques, and reconstruction of the anterior aortic wall. Despite technical success of the procedure, combined with ongoing antibiotic therapy and full postoperative supportive care, the patient developed multiorgan failure and died following unsuccessful cardiopulmonary resuscitation.

DISCUSSION

Epidemiology and risk factors

Infective endocarditis in children occurs predominantly in patients with underlying congenital heart disease, accounting for 77–87% of pediatric IE cases [3,4]. Prior cardiac surgery significantly amplifies this risk, with post-surgical IE rates of 46–51% in dedicated pediatric series [5,6]. The American Heart Association and 2015 ESC guidelines both recognize complex LVOT anatomy and previous surgical correction as major predisposing conditions, particularly when residual hemodynamic turbulence persists, predisposing to endothelial injury and bacterial seeding [1,2]. In such patients, prior surgical intervention may further modify local anatomy through fibrosis and scarring, thereby increasing susceptibility to infection and complicating both diagnosis and management.

Periannular complications and pseudoaneurysm formation

Periannular extension of IE - encompassing abscess, pseudoaneurysm, and fistula formation - represents the most severe local complication of the disease,

associated with markedly increased morbidity and mortality regardless of the underlying valve substrate [1,2]. An aortic root pseudoaneurysm results from contained rupture of the infected aortic wall driven by progressive destruction of the medial and adventitial layers, carrying a high risk of free rupture, fistulization into adjacent cardiac chambers, coronary ostial compression, and sudden hemodynamic deterioration [8,9].

In the present case, the coexistence of a residual subaortic membrane and prior surgical correction likely contributed to persistent LVOT turbulence, facilitating both the onset and progression of infection. The exceptional size of the dominant pseudoaneurysm (63 mm) at presentation in a child with BSA 0.97 m^2 reflects the rapid and destructive nature of this infectious process. The simultaneous occurrence of two distinct pseudoaneurysms at the sino-tubular junction - a configuration rarely described in the pediatric literature - further illustrates the severity of periannular tissue destruction in this setting.

Culture-negative endocarditis

The absence of microbiological documentation is consistent with culture-negative IE, accounting for 2-7% of IE cases in published series. The most common explanation is prior antibiotic exposure - the most likely hypothesis in the present case. Less common causes include infection by fastidious organisms such as Coxiella burnetii, Bartonella spp., Tropheryma whipplei, or HACEK-group bacteria, all requiring specific serological or molecular diagnostic workup [1,2]. The absence of positive cultures did not delay the diagnosis, which was established on clinical and imaging grounds using the modified Duke criteria. This case underlines the importance of systematically collecting blood cultures before antibiotic initiation and of extending the microbiological workup to fastidious pathogens when cultures remain negative.

Diagnostic role of multimodality imaging

Early diagnosis of periannular complications relies on a multimodality imaging approach [11,12,13,14]. While TTE/TEE achieve 97% sensitivity for vegetations, their combined sensitivity for perivalvular abscess and pseudoaneurysm detection is only 63%, significantly lower than cardiac CT alone (81%) [11]. Crucially, the combination of CT and echocardiography reaches 100% sensitivity for abscess and pseudoaneurysm detection [11]. From a prognostic standpoint, CT-detected pseudoaneurysm is an independent predictor of total mortality after IE surgery (HR 3.82; $p<0.001$), while TEE-detected pseudoaneurysm or abscess is the only imaging biomarker independently associated with composite in-hospital mortality and morbidity (OR 3.66; $p=0.001$) [13]. The use of cardiac CT is therefore strongly recommended as a complementary modality in all cases of complicated IE where echocardiography is insufficient [14,15].

In the present case, the complementary roles of TTE and cardiac CT were particularly instructive. On TTE, the aortic root region appeared markedly enlarged, with an apparent diameter of 53 mm at the level of the sinuses of Valsalva. However, contrast-enhanced CT demonstrated normal sinus dimensions (21 × 23 × 23 mm), suggesting that the echocardiographic measurement reflected the combined effect of periaortic inflammatory tissue and the adjacent pseudoaneurysm mass. This discordance between echocardiographic and CT measurements illustrates a well-recognised limitation of TTE in complicated IE: the inability to reliably distinguish true luminal dimensions from periaortic pathological tissue in the presence of large periannular collections. Cardiac CT, by virtue of its contrast-enhanced intraluminal opacification, provided precise anatomical delineation of both pseudoaneurysm cavities, their exact origin at the sino-tubular junction, their relationship with the right coronary artery, and the extent of haemopericardium - information that was decisive for preoperative surgical planning and that would not have been obtainable from echocardiography alone.

Surgical management and timing

In patients with complicated IE including pseudoaneurysm formation, surgical intervention is universally recommended as medical therapy alone is insufficient to control the infectious process and prevent structural progression [16,17]. The presence of a perivalvular complication constitutes a Class I indication for urgent surgery according to current ESC guidelines, defined as intervention within 24 hours when hemodynamic instability or imminent rupture risk is present [2]. In the present case, the combination of a dominant

pseudoaneurysm exceeding 60 mm, active hemopericardium suggesting contained rupture, and severely compromised LVOT anatomy collectively constituted an immediately life-threatening situation precluding any delay.

A meta-analysis pooling 3,003 patients with a formal surgical indication demonstrated a markedly lower mortality with surgery versus conservative management (HR 0.27), with 12-month survival rates of 73.3% versus 32.7% respectively [16]. Early surgery within 7 days is associated with an OR of 0.61 for all-cause mortality, decreasing to 0.30 in propensity-matched analyses [17]. In the pediatric population specifically, surgery for IE carries an operative mortality of 5.8% in large series, with aortic valve replacement identified as an independent risk factor for death (HR 3.22) [5]. The surgical technique employed in this case - combining pseudoaneurysm exclusion, annular enlargement using Manouguian and Konno procedures, and bioprosthetic valve replacement - reflects current recommendations for radical debridement and anatomical LVOT reconstruction in the setting of destructive infective endocarditis [18].

Despite timely and technically successful surgery, the patient succumbed to multiorgan failure, a recognized postoperative complication in the setting of advanced preoperative hemodynamic compromise, severe anemia, and the systemic inflammatory response of active endocarditis. This outcome underscores the inherent limitations of surgical salvage once structural destruction has reached this extent in the pediatric patient, and reaffirms the critical importance of early recognition and referral to specialized centers.

CONCLUSION

This case illustrates the exceptional severity of aortic IE complicated by dual pseudoaneurysm formation in a child with complex LVOT anatomy and prior surgical repair. Three key clinical messages emerge: first, children with prior correction of congenital LVOT obstruction constitute a high-risk population for severe IE requiring heightened clinical vigilance and systematic echocardiographic follow-up; second, multimodality imaging combining echocardiography and cardiac CT is essential for early diagnosis, precise anatomical characterization, and surgical planning of periannular complications; and third, despite aggressive and technically successful surgical intervention, the prognosis remains poor when structural destruction is advanced at the time of presentation. A fully integrated multidisciplinary approach -combining cardiology, cardiac surgery, anesthesiology, and infectious disease expertise within a dedicated endocarditis team -is indispensable in the management of such complex pediatric cases.

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